



**Study Committee C6  
Distribution Systems and Dispersed Generation**

**Strategic plan for the period  
2007-2016**

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## 1. INTRODUCTION

### 1.1. Purpose of the SC Strategic Plan

The purpose of the Study Committee (SC) Strategic Plan is to define the main mid to long term strategies of the Committee and provide a global framework for its activities.

The SC Strategic Plan takes into consideration the mission and objectives stated by the CIGRE Technical Committee (TC) as defined in 2002, when re-organisation of CIGRE was concluded, as well as the factors which are affecting or are expected to affect its activities in the area of specific competence.

A first Strategic Plan was prepared at the time of creation of the SC, to cover the period 2002 – 2004. In keeping with established CIGRE practice, the new Strategic Plan covers a decade (2007 - 2016); it shall be periodically updated in order to allow for suitable adaptations.

A new SC Action Plan covering a period of three years (2007 – 2009) will define a set of priority short-term actions linked with the implementation of this Strategic Plan.

### 1.2. Mission of the SC

The Mission of the SC is to facilitate and promote the progress and the exchange of knowledge in the field of system impact of distribution systems integrating dispersed generation, by synthesising state-of-the-art practices and developing recommendations.

### 1.3. Scope of the SC

The Scope of the SC is to assess the technical impacts and requirements which a more widespread adoption of DG and which a larger proportion of undispachable power generation could impose on the structure and operation of transmission and distribution systems. In parallel the SC also assesses the degree to which such solutions are likely to be adopted in the short, medium and long term and, consequently, the practical importance and timing of the technical impacts and requirements mentioned above. Rural electrification, demand side management methodologies and application of storage are within the scope of this SC.

### 1.4. SC Targets groups

Targets Groups are the SC customers; the activity of the SC has to be focused on the satisfaction of their needs in the specific field of action. SC Targets Groups are:

- ✓ Technical Groups: Network planners, Network engineers, Manufacturers
- ✓ Operators: Distribution Network Operators, Power System Operators

- ✓ Commercial Groups: Generation Companies, Distribution Companies, Consumers, Energy Traders, Representatives Bodies, ESCO
- ✓ Science and Public Groups: Regulators, Universities
- ✓ Similar International Organisations: CIREN, EURELECTRIC, IEA, IEC, IEE, IEEE

### 1.5. Main goals of the SC

The main goals of the SC are :

- ✓ Develop new (for CIGRE) knowledge in the field of Distribution System and Dispersed Generation
- ✓ Identify the main needs of the SC Target Groups and indicate new researches to be performed
- ✓ Develop technical analysis on the impact of DG to support National Bodies in developing policies
- ✓ Integrate in the SC new members who don't have experience in the organisation and activity of CIGRE, also coming from professional areas previously not considered by CIGRE (for instance, distribution utilities and companies)
- ✓ Involve people from developing countries
- ✓ Promote the name of the SC in non-traditional (for CIGRE) areas
- ✓ Establish links with other bodies active in the field of the SC

### 1.6. Composition of the SC

The SC is composed by :

- ✓ The SC Chairman.
- ✓ The SC Secretary.
- ✓ 24 Regular members
- ✓ 13 Observer members.
- ✓ Working Groups (WG) aimed to perform extensive activities on broad subjects of paramount importance for the SC. Their activity has to be completed in 3-4 years.
- ✓ Task Forces (TF) aimed to perform activities on subjects of specific and present interest where results are required in due time. Their activity has to be completed in 2 years
- ✓ Advisory Groups aimed to perform preliminary investigations on subjects of interest for the SC in view of possible future activities or to assist the SC Chairman to perform the mission and to pursue the scopes assigned by the TC. The activity could last one or more years.

Participation to WG/TF is open. Deliverables are reports, technical brochures and summary for ELECTRA, papers for CIGRE conferences and symposia.

Participation to AG is limited to SC members. Deliverables are terms of reference for new WG/TFs, reports dealing with the management of the SC, proposals on strategies and organisation of the SC.

## 2. KEY FACTORS

The Master Plan of CIGRE established in 2000 stated that CIGRE should look at the “Electrical System” as a whole, including all interconnected components whose role is the conversion of primary energy sources into electricity and the further transmission and distribution of electric energy to the end user. In particular it is noted that **Dispersed Generation** is within CIGRE’s scope. Consequently in 2002 a new SC was created on “**Distribution Systems and Dispersed Generation**” .

In the recent years the concept of DG was continuously promoted by a number of driving forces deriving from some technological features the dispersed generators have and based on some function they may provide; these forces are:

- ✓ No additional transmission costs, savings in distribution costs (depending on DG location)
- ✓ Intrinsic modularity of new DG technologies: low scale factor on costs is expected
- ✓ Expected improvements in reliability and PQ on the customer side. Improvements on the system side depend on types and rules of integration
- ✓ The creation of open and competitive electricity markets
- ✓ DG based on micro - mini CHP (Combined Heat Power) systems provide high efficiency in conversion from primary energy sources
- ✓ DG is an important instrument to exploit renewable energies:
  - low environmental impact
  - reduction in energy importation from abroad (local available energy sources are used)
  - existence of subsidies developing programs at international and national level

Notwithstanding the above favourable factors, Dispersed Generation, apart from the case of some countries, has still, at the beginning of the new millennium, a small share of installed generation capacity. This is due to the existence of barriers such as:

- ✓ High technology cost (the development of some technology is still in progress)
- ✓ Existing distribution networks not designed for DG integration (there is the need for additional investments and distribution operators have some concern about the actual possibility to recover them)
- ✓ Criteria and rules to operate distribution networks to be modified and internationally agreed
- ✓ Contribution of DG to system operation (i.e., ancillary services) currently not fully recognised
- ✓ Absence of market rules and of business models to be adopted
- ✓ Economic/financial barriers due to difficulties in getting funds from banks

### 2.1. Key factors affecting the operational activities of the SC and its working bodies

The Sc was created when transition towards liberalised electricity markets was still in progress in many countries. Moreover the mandate the SC

received was to work on subjects (DG and distribution) new for CIGRE, but already dealt with by other organisations. The SC operation has therefore to take into account factors such as:

- ✓ Many members of SC are without experience of CIGRE rules and practices
- ✓ Limited availability of electric companies to provide financial support for experts to work in CIGRE.
- ✓ Relations with other CIGRE SC
- ✓ Relations with other associations

## 2.2. Key factors affecting the choices and priorities of the SC

Notwithstanding the low enthusiasm of distribution operators towards the real development and application of the DG concept, the idea that DG is a strategic topic the operators have to face is gaining acceptance. An increase in dispersed generators to be integrated to power systems and in particular to distribution networks is unavoidable and the relevant issues have to be studied and suitable solutions identified and proposed.

Experience with the implementation of DG is quite different in different countries across the world. The task of SC C6 is to share the existing knowledge and to work out recommendations for new guidelines supporting the further enhancement of the technologies and their penetration into the power systems. The 2003 workshop organised by the SC during the annual meeting held in Montreal in conjunction with the CIGRE Symposium was a first step in this direction; in any case it provided some clear indication on what it is expected from the SC activities

- ✓ Exchange of information (based on real projects) on problems and solutions relevant to “*connection, integration and operation of dispersed and renewable based (wind in particular) generators*”: the aim is to identify and share the “*best practices*”,
- ✓ Exchange of information on research projects,
- ✓ Support the development of internationally accepted rules and standards,
- ✓ Support the development of internationally accepted models and benchmarks,
- ✓ Identify the requirements for DG component manufacturers and provide recommendations for the technical content of Distribution Codes and Grid Access Rules.

## 3. STRATEGIC DIRECTIONS

### 3.1. Administrative directions

The present structure and organisation of the SC is in line with the Reference Model prepared by the CIGRE TC; the set-up and operation of the working bodies are respecting the Guidelines prepared by the Central Office. The efforts of the SC should be focused on the specific issues that follow.

- ✓ To develop and maintain a high level technical role of the SC on the subject of DG that is of high interest for other international organisations. To develop and exploit synergies, while respecting rules and recommendation stated by TC
- ✓ To increase the flexibility and develop speed of reaction of the SC just to catch in due time new issues of interest of the SC Target Groups
- ✓ To promote and facilitate the active participation of all the SC members.
- ✓ To maintain a significant number of working bodies realistically tailored with the disposition of electric power industry to support expert participation
- ✓ To continuously and carefully monitor the activities of SC working bodies to assure the achievement of objectives while respecting the assigned schedule
- ✓ To ensure that the specific issues affecting newly industrialised and developing countries are appropriately addressed.
- ✓ To strongly take care of communication and dissemination of the achievement of the SC also by the use of tools such as websites (already prepared but to be continuously updated and improved) and tutorials.

### 3.2. Technical directions

Since its creation the SC studied, through the activities of WGs and TFs, the several aspects of DG integration into the power system. The search for new subjects to be examined shall take into account the remarks that follow:

- ✓ There are still additional aspects to be studied related to the connection and the integration of dispersed generators, including related devices such as storage, electronic base interfaces and systems. The concept of Dispersed Energy Resources (DER) has been introduced and now widely used
- ✓ The application of the DG concept has also to be studied as a part of the medium long term evolution of distribution systems, i.e. creation of active distribution networks able to contribute to the improvement of the overall performances of electric power systems.
- ✓ The activity of the SC could be extended to study the evolution of distribution networks including subjects that are not strictly related to the application of DG concept.

The future activities of the SC shall be addressed to deal with subjects as those that follow.

- ✓ Analysis of demand evolution aimed to identify DG requirements and actions for demand side activities. WGC6.09 started in 2005 to study concepts like Demand Side Management, Demand Side Response, Demand Side Initiative; the WG is now adopting the concept of

Demand Side Integration (DSI) encompassing all activities aimed to advance the efficiency of electricity utilisation

- ✓ Review of the distribution planning process and related techniques considering DER/RES, DSI, etc.
- ✓ Contribution of distributed energy resources to energy policy objectives; overview on energy policies adopted in some countries, on the role assigned to DER/RES and on the relevant planned strategies for the policy implementation.
- ✓ Economic evaluation of costs and benefits of distributed energy resources, including identification of ancillary services that DER may provide.
- ✓ Methods applied in many countries to develop benchmarks for the evaluation of the performances of distribution systems (integrating DER, renewables, DSI, etc.): issues considered, indices adopted, comparison methods, etc.
- ✓ Distribution utilities/operators requirements for the integration of distributed energy resources. The activity should deal with:
  - Distribution Grid Code introduced in some countries;
  - DG fault level contribution and technical specifications of DG components (to preserve distribution network reliability);
  - Requirements on DER performances during transmission and distribution failures (“fault ride through” capability)
  - Proposal of new standards (for example to impose field tests).

The activity may be considered an extension of WG C6.04 that ended the activity in 2006.

- ✓ Plug and play distributed energy resources (to facilitate the use by end user and system customers): functions, technical characteristics and requirements.  
Also this activity may be considered as an extension of WG C6.04.
- ✓ Intelligent technology and management systems of distribute energy resources (basic concepts, control functions, review of research projects and prototypes development in various countries). The activity should start with a review of what is already existing.
- ✓ Possible role of distribution networks, integrating DER and DSI, to improve system security.
- ✓ Market rules and business models for DG implementation and exploitation.
- ✓ Utilisation of new information sources and information technologies.  
The activity has to be considered as a further extension of WG C6.03 that ended its activity in 2006.
- ✓ Technical, economical and organisational issues relevant to electrification extension or to electricity supply in areas with very low pro-capita consumption (“Rural electrification”). The activity has to be

considered the prosecution of WG C6.13, scheduled to achieve the present objectives by 2008.

#### **4. REFERENCE DOCUMENTS**

- [ ] Technical Committee Strategic Plan 1998 – 2008, Update 2004 - 2008.
- [ ] CIGRE Master Plan, October 2000.
- [ ] CIGRE Rules for Study Committees, edition of August 2002.
- [ ] Reference model for CIGRE Study Committees, July 2003.
- [ ] Guidelines for Study Committees, Working Groups and Task Forces